provided that l, m, n ; λ, μ, ν are *correlated* systems of coordinates.

Images: Reciprocals or Polar Reciprocals

It is very convenient to speak of any function which equated to zero expresses a figure as an *image** of such figure; thus *ex. gr.* $\xi x + \eta y + \zeta z$ may be spoken of as an image of the line ξ, η, ζ and of the point x, y, z.

A curve being the concept common to a locus and an assembly (the common ground, so to say, of the existence of each of them), will be capable of being imaged in terms of either direct or inverse coordinates. If the two coordinate systems are supposed to be correlated (as they ought always to be) then any two homogeneous functions which are reciprocal, or, let us say, conjugate to one another (each in common parlance the *polar reciprocal* of the other) will be images—the one of the curve under its aspect as a *locus*, the other of the very same curve under its aspect as an *assemblage*.

Reduced Perpendicular Distances

An extremely convenient system of homogeneous coordinates of a point is where each coordinate is the distance from one of the boundaries of the fundamental enclosure divided by the distance of that boundary from the opposite angle. Such coordinates may be termed coordinates of reduced distance or reduced coordinates; they are analytically defined by their sum being unity. If a, b be the two vertices which correspond to the coordinates of reduced distances, the squared distance of any two points, $x, y, z, \ldots$; $x', y' z', \ldots$ in extension of any order is capable of being expressed by the formula $\Sigma(ab)^2(x-x')(y'-y)$, which, as far as I have been able to ascertain, is nowhere stated in the books, except for the case of trilinear coordinates.

Exchangeable Figures

Two figures indistinguishable from each other by any of their internal properties, but incapable of occupying the same place (such as the left- and right-hand glove or shoe) have received the very awkward and misleading name of *symmetrical* figures; I propose to call them exchangeable figures, inasmuch as in the nature of things, as they are in themselves (without regard to the limitation of the human faculties), they may be made to pass into each other's places by a semi-revolution about a suitable homaloidal axis.

The Point-Pair at Infinity, Lines and Planes of Null

It has been already shown in these columns that the "absolute" in a plane has full right to be called the *point-pair* at infinity, in analogy with the received expression of the *line* at infinity, and those who have considered what has been here stated under the head of *reciprocity* will see good grounds for admitting that the line at infinity ought to be regarded as a complete line, *i.e.* as made up of two analytical "semi-droites."

Every line through either half of the absolute besides the property of being infinitely distant from any point in the finite region may be termed a *line of null*, in the sense that the distance between any two points in such line is zero.

In like manner any plane *touching* the absolute in extension of the 3rd order, besides being infinitely distant from the finite region, is in the same sense a *plane of null;* in it, form is divorced from content, for a figure of any shape being described upon such plane, its content will be *nil*.

Pluri-duality: Containing and Contained

In extension of i dimensions each continuum of λ dimensions stands in a relation of reciprocity to one of $i-\lambda-1$ dimensions, the total number of these "dualities" being $\frac{i+1}{2}$ when i is odd and $\frac{i}{2}$ when i is even (in the former case the continuum of $\frac{i-1}{2}$ dimensions being its own reciprocal). It is very convenient in connecting reciprocal geometrical statements to ignore the difference between (and to regard as exchangeable and equivalent) the terms *containing* and *contained in* as applied to heterogeneous continua; indeed the ordinary distinctive use of these words suggests an erroneous conception; as *ex. gr.* of a line being *made up* of points or a plane of lines. A point may be said to contain every line or plane which passes through it, and a line every point which lies on it, and every plane which passes through it: as an example of this extended locution the order, rank, and class of a surface may be defined as follows—viz. the order and class as the number of its point and plane elements respectively contained in any given line; the rank as the number of its line elements contained in common by any given point and plane which contain one another.

A plane-section of a surface is the totality of its point- or line-elements contained in a plane and similarly a point-section (an enveloping cone), the totality of its plane- or line-elements contained in a point: hence indifferently the class of any plane-section or the order of any point-section of a surface is its rank.*

J. J. SYLVESTER

NOTES

ALL the five French academies will celebrate by a banquet the ninetieth anniversary of the foundation of the Institut, which was established on October 25, 1795, by the Conseil Législatif and Directoire Executif of the French Republic. The actual organisation is not quite the same as the original, great alterations having been made in 1814, and only partially abolished on subsequent occasions.

THE death took place last month of General J. J. Baeyer, President of the Central Bureau for European Triangulation and of the Royal Prussian Geodetic Institute. General Baeyer had reached the age of ninety-one years. A biography of some length will be found in the *Astronomische Nachrichten*, No. 2687.

M. ROBIN, a member of the Paris Academy of Sciences and of the French Senate, died last week. He had devoted his exertions to microscopy, and was professor to the School of Medicine.

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* When an *image* is given, its *object* is absolutely determined, but not *vice versâ*, since an image may be magnified or diminished at will by the introduction of a constant factor.

* The word *spread*, to signify an unlimited expanse of discontinuous points and so used by Dr. Henrici, is, I am informed, originally due to the late Prof. Clifford. In ignorance of this fact, on hearing that Henrici had been attacked for his use of the word, I stated my belief that it must have been borrowed from my use of it to signify a limited portion of a tissue of equi-spaced points, such as that which is turned to so profitable account in *my constructive theory of partitions* in the *American Journal of Mathematics*.

I did not know at the time that Clifford had used the word, nor that Dr. Henrici's treatise preceded by several years the publication of my memoir above referred to. This erroneous oral statement seems to have found its way by some more or less circuitous channel to the columns of the *Saturday Review* in a notice of a criticism, by Mr. Dodgson, of Dr. Henrici's geometrical manual in the Scientific Series. Dr. Ferrers (the Master of Caius College, Cambridge) was the first to apply a spread to demonstrate intuitively a celebrated arithmetical theorem of reciprocity due to Euler. Mr. Durfee a quarter of a century later led the way to a further and more pregnant use of the same by showing how to trisect a symmetrical spread bounded by two right lines and a broken line into a regular square and two quasi-triangular appendages, to which I superadded the notion of multisecting it into a succession of angles. Another pupil of mine at the Johns Hopkins University (Mr. Ely) has laid the foundation of a new theory of partitions, by studying the various modes of decomposing a *solid* spread of discontinuous points; his memoir on the subject is to be found in a recent volume of the *American Mathematical Journal*.

By means of the trisection method I obtained *inter alia* a new expansion of $(1-xz)(1-x^2z)\ldots.(1-x^2z)$, which, on making z unity and n infinite leads immediately to Euler's celebrated pentagonal-power series, and other results of a totally novel kind by the multisection method: so that a *spread* may justly be regarded as a potent instrument or magical mirror for extending old and bringing to view new truths in the *wonderland* of partition and elliptic-function series.

By invitation of the Lieutenant-Governor of the Isle of Man Prof. Boyd Dawkins recently visited that island in order to report on its antiquities and the best means of preserving them. The result is given in a short communication to the Lieutenant-Governor, in which Prof. Dawkins indicates the present condition of the various classes of remains. He points out what should be done for their preservation, and advises that the island Legislature should pass an Act similar to the "Ancient Monuments Act" of the "neighbouring islands" of Great Britain and Ireland. The advice given by Prof. Dawkins is sound, and it is creditable to the Lieutenant-Governor that he has shown so much intelligent zeal in the matter. We are glad to note that he intends to follow up his action by introducing a bill into the Council with a view to carrying out Prof. Dawkins's recommendations.

The last publication of the Japanese Meteorological Observatory which has reached us contains the monthly summaries and monthly means for 1884, and is accompanied by forty-one maps, showing the isobars, isotherms, and prevailing winds. These volumes must demand unusual care on the part of the compiler, for they are printed in Japanese as well as English, and contain a mass of meteorological data of all sorts. We observe that three new stations have been added during the year, one in the north of Yezo, and the other, which should prove a valuable station, is at Fusan, the port of Corea recently opened to Japanese trade. This constant annexation of new territory by the Tokio Meteorological Bureau is to be highly commended.

A recent issue of *Cosmos* contains an account of the Jesuit establishments at Zikawei near Shanghai, the meteorological publications of which have frequently been noticed in Nature. The central establishment of the Jesuits in China is at Funkadoo in Shanghai, but about six miles away at Zikawei (Siccawei) they have a large adjunct, containing their schools, an orphanage, and a college. In the course of its existence the place has been twice sacked, but it was again rebuilt. In 1870 the fathers began with the rudiments of a meteorological observatory, of which Father Dechevrens was the founder, and has been to the present moment the director. Gradually, by purchase and by presentations from various Governments, the observatory became tolerably well equipped, and it is now a magnetic and meteorological station of the first order, making with excellent instruments observations on atmospheric pressure, temperature, humidity, evaporation, rain, winds, solar radiation, terrestrial magnetism in its various manifestations, &c. It issues a monthly *Bulletin* containing the observations, and a *résumé* and discussion of the meteorological events of the month. Thanks of the numerous missionaries scattered over the neighbouring provinces, who correspond with the director, the peculiar atmospheric movements in the China seas are beginning to be understood. Quite recently (as mentioned at the time in Nature) he has taken advantage, with the assistance of Sir Robert Hart, of the Telegraphs, to establish a regular daily weather service, for the benefit of mariners. The observatory is situated in a vast plain, where the horizon alone stops the view, and where atmospheric movements are not complicated by ranges of hills. A tower 33 metres in height has been erected, and the Beckley anemometer, constructed in 1884 by Munro, of London, is placed on a platform 7 metres higher. The observatory has gone on developing year by year, and there is little doubt that it will soon include in its field astronomical observations. The *Bulletins* are printed at the mission printing-press, which is included in the establishments at Zikawei, the printers being young Chinese. The monthly *Bulletins* form a considerable volume at the end of the year, and that for 1884, which has lately been issued, is the tenth in the series.

With regard to the new star in Andromeda Dr. Sophus Tromholt relates the following curious story in a Norwegian journal:—"When the interesting discovery had been made in 1877 that Mars was accompanied by two moons, it was shortly afterwards pointed out that Swift, in 'Gulliver's Travels,' relates that the Liliputian astronomers had discovered the two satellites (Voltaire, too, in a work in which he describes the experiences of two terrestrial beings on Mars, says that they saw the two moons unknown to mundane astronomers, but he has probably borrowed the idea from Swift). A similar remarkable proof that poets may also be prophets in astronomy has just come to light with regard to the new star in Andromeda. In the Hungarian periodical *Losonczi Phönix* for 1851 is a story by Maurus Jókai, the celebrated author, in which he refers to this star. Jókai makes an old Malay (?) relate that the Evil Spirit, Asafiel, revealed to King Saul and his sons the star in the nebula, and predicted that those who could not see it should perish in the impending battle. The Malay also reveals the star to his listeners and describes its position so accurately that there cannot be any doubt of the Andromeda nebula being the one referred to, although it is not named. The story, according to Jókai, rests on a biblical or Jewish legend. On the writer of these lines asking one of the greatest living authorities on biblical research whether the bible contains any reference to the point, he is informed that there is absolutely no such reference in that book, and that it is hardly possible that the nebula is mentioned in any Jewish legend. It is first mentioned by a Persian astronomer of the tenth century, and was first discovered in Europe in 1612. It would be exceedingly interesting to ascertain whether any Jewish tradition has preserved the mention of a star in the Andromeda nebula, as from this might be concluded that the new star is a variable one with a long period. I intend to inquire of Jókai whether his story is founded on any tradition or only an outcome of the author's imagination, but even should the latter be the case the story is a very curious one."

Algology is becoming a favourite science with some Russian botanists. After the valuable researches of Dr. Gobi on the algæ of the Gulf of Finland, several memoirs have been published by MM. Reinhardt and Rishavi on those of the Black Sea, and we find now in the last issue of the *Memoirs* of the Novorossian Society of Naturalists (ix. 2) an elaborate paper, by M. Reinhardt, being contributions to the morphology and classification of the Black Sea algæ. The paper is the first of a series. Following Bornet and Thuret's example given in their "Notes Algologiques," the author publishes his observations on separate species, without awaiting the time when he will be enabled to publish a more complete work. In the morphological part of his paper, M. Reinhardt discusses the development of a few Chlorophylleæ, and enters into more details with regard to some of the Cyanophyceæ, and especially the Phæosporeæ (the conjugation of *Ectocarpus siliculosus* and the growth of *Sphacelaria*). As to the Rhodophyceæ, only short remarks, especially as to pores in their external covering, are given. The chief attention has been devoted, however, to the Bacillariaceæ, and the paper contains a good deal of new observations on the structure of gelatinous colonies, the structure of the cell and its protoplasmatic parts, and the auxospores. The systematical part will appear in a next issue. The paper is accompanied by eleven tables engraved in Germany.

The same volume contains a very interesting paper on the development of Rotifers, by the Director of the Sebastopol Zoological Station, Miss Pereyaslavtseff. This subject has been rather neglected until now, and M. Zaleski's paper on the history of the development of the *Brachionus urceolaris* could not be considered as a complete solution of the question. Miss

Pereyaslavtseff's method differs from most of those hitherto recorded: she does not select one or another phase of development as being the most important, but, placing several Rotifers and Lepadellæ under the object-glass of a microscope, she waited until one of them would lay an egg, and the development taking about three days from the beginning of the segmentation until the issue of the new animal from the egg, she observed it continually throughout the first thirty to thirty-five hours, with only short interruptions of two to three hours in the observation of subsequent phases. This method has of course its inconvenience by preventing sleep for two nights. It cannot be applied also to those Rotifers which live an errant life. These last do not survive confinement, and must be kept in watch-glasses until they lay their eggs, which last are then brought under microscopic investigation. Ten different species were studied in this way, and proved to undergo the same development, so that *Rotifer inflata* has been given as a type of the development of the egg. The stages are all figured in forty-eight drawings on a plate accompanying the memoir.

THE same volume contains, moreover, three papers on geology: one by M. Sintsoff, on Tertiary fossils from Novorossia, being a description of the following new species: *Anodonta unioides*, *Scrobicularia tellinoides*, *Ervilia minuta*, *Neritina pseudo-Grateloupana*, and several others formerly described; it also contains a list of the fauna of the intermediate Ponto-Sarmatian deposits of the region. Another, by M. Miklashevsky, gives some information on the Government of Tchernigoff; and a third, by M. Andrusoff, deals at length with the geology of the Kertch peninsula, and throws some new light on the confused geology of the Crimea. It appears from the author's researches that the Tertiary deposits of the Crimea may be subdivided into the following: (*a*) the true *Congeriæ* deposits (Pontri), consisting of iron-bearing clays, equivalent in West Europe to the deposits of Hidas and Arpad, and of limestones, sandstones, and marls equivalent to the *Dreissena triangularis* deposits of the Vienna basin, the *D. rostriformis* deposits of Ploeshti and the upper Siebenbürgen deposits; (*b*) the Ponto-Sarmatian intermediate group of the Kertch limestone, equivalent to the lower Siebenbürgen deposits; (*c*) the Sarmatian group, equivalent to the same of Roumania, Turkey, and Austria-Hungary; and (*d*) the Upper Mediterranean, equivalent to the *Leythakalk*, the *Badner Tegel*, &c. It would result from the above, and from what is known about South Russia and the Crimea, that during the older Miocene period both were a continent. Later on they were invaded by a sea penetrating from the west, and a narrow gulf limited in the south by the Yaiba hills, extended towards the East. During the Sarmatian epoch the subsidence continued, followed soon by an upheaval towards the end of that period, which upheaval led to the formation of narrow, less settled bays, like those we see now on the Kuban, at the place formerly occupied by the Sarmatian Gulf.

The Garner and Science Recorder's Journal is the title of a new scientific monthly, edited by Mr. A. Ramsay, and published by W. E. Bowers, Walworth.

A SOCIETY for the Advancement of Science has been formed in Bergen, numbering about a hundred members, the President being Dr. Danielsen.

MR. ARTHUR S. PENNINGTON'S Manual of British Zoophytes, to be published immediately by Messrs. L. Reeve and Co., will include not only the Hydroida but also the Actinozoa and Polyzoa found in Great Britain, Ireland, and the Channel Islands. The same publishers announce an illustrative volume of "Collections and Recollections of Natural History and Sport," by the Rev. G. C. Green.

WE have received the sixteenth annual Report of the Norfolk and Norwich Naturalists' Society, forming part 1, vol. iv. of the *Transactions*. Amongst the published papers is a presidential address by Mr. Francis Sutton, F.C.S., on the nitrification of soils by means of minute living organisms; and the same gentleman also contributes a most valuable paper on the varieties of sugar, natural and artificial; Mr. Horace B. Woodward, F.G.S., gives a paper on the earthquake of April, 1884, which made itself so severely felt in the counties of Norfolk and Suffolk; Mr. F. D. Power, who visited the Norfolk coast during the period of the autumnal migration, in his "Ornithological Notes from Cley and Blakeney," shows the wonderful influx of birds, some of which are generally supposed to be of the greatest rarity, which takes place on the eastern coast at that period; amongst Mr. Power's list of rarities occurs the blue-throated warbler, of which he says he must have seen from eighty to one hundred individuals, and the barred and ictarine warblers. Mr. J. H. Gurney, jun., also contributes some valuable facts bearing upon the vexed question of migration, for the observance of which the Norfolk coast is so favourably situated. Mr. Southwold furnishes his usual review of the herring fishery from the ports of Yarmouth and Lowestoft, from which it appears that the enormous number of 505,005,600 fish were taken by the fishermen using those two ports; the same gentleman also contributes a paper on the white-beaked dolphin, a Cetacean which has been procured on several occasions on the east coast. The "Ornithological Notes" of Mr. Hy. Stevenson, F.L.S., are in continuation of a series extending back for many years; and a most interesting memoir of John Scales is contributed by Prof. Newton, forming one of a series of memoirs of naturalists of whom the county of Norfolk has since the commencement of the present century produced so many notable examples.

AN experiment has recently been tried at the Inventions Exhibition Aquarium by Mr. W. August Carter with a view to discovering how far fish are prone to sleep. After close examination he found that amongst freshwater fishes the roach, dace, gudgeon, carp, tench, minnow, and catfish sleep periodically in common with terrestrial animals. The same instincts were found to actuate marine fish, of which the following were observed to be equally influenced by somnolence—viz. the wrasse, conger eel, dory, dogfish, wrasse bass, and all species of flat fish. Mr. Carter states that, so far as he can discover, the goldfish, pike, and angler fish never sleep, but rest periodically. Desire for sleep amongst fish varies according to meteorological conditions. Fish do not necessarily select night-time for repose.

THE specimens of fish collected for the International Ichthyological Museum, which is being formed by the National Fish Culture Association, now number about 500. They include many rare fish as well as those of extraordinary growth and formation. Many of the specimens are the finest to be seen in London, having been specially caught for the Association by qualified ichthyologists and agents. The work of setting the fish out in glass jars is now being commenced, and it is hoped to be able to exhibit them to the public shortly.

WE have received the third and concluding part of Dr. Hann's paper before the Berlin Academy of Sciences on the temperature of the Austrian Alps. The tables contain monthly and yearly averages of temperature for 382 stations in the Austrian Alps and the neighbourhood reduced to the true (24-hour) average, and to a thirty-year period (1851-80). Of the stations 277 were below 1000 metres, 88 lay between 1000 and 2000, while 17 were over 2000 metres in height. The data obtained at all these stations over a period of years are here worked up and arranged. The present part contains over 160 pages, so that the whole paper would make a considerable volume dealing with temperatures in the Alpine regions of Austria.

M. D'ABBADIE begs us to state that the earth-tremors observed in his apparatus (NATURE, vol. xxxii. p. 568) about two miles north of the Spanish frontier coincided with the many earthquakes in the south of Spain. There were no such phenomena in Egypt.

THE additions to the Zoological Society's Gardens during the past week include a Bonnet Monkey (*Macacus sinicus* ♂) from India, presented by Mr. L. C. Phillips; a Ring-tailed Coati (*Nasua rufa* ♂) from South America, presented by Lieut. W. F. Tunnard, R.N.; a Black Wallaby (*Halmaturus ualabatus* ♂) from South Australia, presented by Mr. R. E. Wootton Isaacson; a Javan Cat (*Felis javanensis*) from Java, presented by Capt. T. H. Franks; a Puma (*Felis concolor* ♂) from South America, presented by M. Rodolfo Aranz; two West Indian Rails (*Aramides cayennensis*) from Brazil, presented by Mr. J. C. Fraser; a Levaillant's Amazon (*Chrysotis levaillanti*) from Mexico, presented by Mr. H. D. Astley, F.Z.S.; a Silver Pheasant (*Euplocamus nycthemerus*) from China, presented by Mrs. James; three Robben Island Snakes (*Coronella phocarum*), a Hoary Snake (*Coronella cana*), a —— Elaps (*Elaps hygiæ*), a Reddish Pentonyx (*Pelomedusa subrufa*) from South Africa, seven Geometrical Tortoises (*Testudo geometrica*) from the Orange River, South Africa, presented by the Rev. G. H. R. Fisk, C.M.Z.S.; a Rose-crested Cockatoo (*Cacatua moluccensis*) from Moluccas, deposited; a Blue and Yellow Macaw (*Ara ararauna*) from Trinidad, received in exchange; eight Summer Ducks (*Œx sponsa*, 4 ♂ 4 ♀) from North America, purchased; a Bennett's Wallaby (*Halmaturus bennetti* ♀), born in the Gardens.

ASTRONOMICAL PHENOMENA FOR THE WEEK, 1885, *OCTOBER* 18–24

(FOR the reckoning of time the civil day, commencing at Greenwich mean midnight, counting the hours on to 24, is here employed.)

At Greenwich on October 18

Sun rises, 6h. 31m.; souths, 11h. 45m. 9·9s.; sets, 16h. 59m.; decl. on meridian, 9° 47′ S.: Sidereal Time at Sunset, 18h. 48m.

Moon (two days after First Quarter) rises, 14h. 51m.; souths, 20h. 0m.; sets, 1h. 17m.*; decl. on meridian, 10° 27′ S.

Planet	Rises h. m.	Souths h. m.	Sets h. m.	Decl. on meridian ° ′
Mercury	6 37	11 51	17 5	9 43 S.
Venus	10 37	14 30	18 23	23 26 S.
Mars	0 6	7 38	15 10	16 38 N.
Jupiter	3 35	9 54	16 13	3 5 N.
Saturn	20 41*	4 49	12 57	22 17 N.

* Indicates that the rising is that of the preceding and the setting that of the following day.

Phenomena of Jupiter's Satellites

Oct.	h. m		Oct.	h. m.	
21	4 32	I. tr. ing.	22	4 10	I. occ. reap.

The Phenomena of Jupiter's Satellites are such as are visible at Greenwich.

Oct.	h.	
20	0	Saturn at least distance from the Sun.
20	13	Saturn stationary.

GEOGRAPHICAL NOTES

THE work done by Lieut. Wissmann in his exploration of the Kassai River, the great southern tributary of the Congo, is second in importace only to the discovery of the Congo itself. It will seriously modify the conjectural geography of that part of Africa. He found the river to be of immense volume, and navigable from its junction with the Lulua. He found the Sankuru and the Lubilash to be one river, which, instead of flowing northwards to the Congo, turns westwards, and joins the Kassai. As it approaches the Congo Kassai receives the great Koango, and enters the main river by the Kwamouth, after receiving the water of Lake Leopold. Thus the river which on Stanley's last map joins the Congo west of Stanley Falls cannot be the Lubilash, and, moreover, must be of no great length. This discovery of Lieut. Wissmann, along with that of the Mobangi by Mr. Grenfell, greatly increases the navigable waterway of the Congo system.

THE September number of *Petermann's Mittheilungen* has for its principal article the first part of an account of Paulitschke and Hardegger's journey to Harar, by Dr. Paulitschke. It is accompanied by a map of the districts traversed. The present instalment describes the circumstances under which the journey was undertaken, the preparations at Zeila, where the English consul was able to put the travellers in friendly communication with Abu Bakr, the Governor of Zeila, who gave them the most important help, and the details of the journey as far as Bussa, on the frontier of the Northern Gallas country. Dr. Schinz asks the question whether Namaqua-Land or Nama-Land is correct, and decides in favour of the latter. "Namaqua" is a Dutch corruption; the term "Nama" is applied to Hottentots in general, without any distinction of sex; "namaqua" is properly "namagu" or "namaga," the nominative and dative plural of "nama"; "qua" is therefore doubly wrong as a suffix, and Namaland is the proper term. M. Rabot writes on the Stor Börgefjeld in Nordland in Norway, and the usual literary and geographical news brings the number to a conclusion.

THE last number (Band xxviii. No. 29) of the *Mittheilungen* of the Geographical Society of Vienna contains a paper on the ethnic members of the western Somali and north-eastern Galla tribes, by Dr. Paulitschke, accompanied by a map; six letters from Dr. Lenz on his Congo expedition, and the first part of a paper by Herr Jülg on the erosive action of the sea on coasts; the bibliography of Africa for the last half year, and the usual notices of geographical works conclude the number.

M. BRAN DE SAINT POL-LIAS, who was sent on a scientific mission to Tonquin and Java, returned to France towards the close of September. He brought back with him numerous specimens of the flora and fauna of the districts through which he travelled.

THE chief geographical societies in Germany have resolved to erect a monument to the late Dr. Nachtigal on Cape Palmas, where he lies buried. It is intended to have it so large that it will serve as a landmark to seamen.

THE Godeffroy Museum at Hamburg, illustrative of the natural history of the South Sea Islands, has been sold to the Ethnographical Museum of Leipsic.

THE GREAT OCEAN BASINS[1]

I.

THE ancients, down to the time of Aristotle—and most of them for a long time afterwards—regarded the earth as a great plain surrounded on all sides by the mighty, deep, gently-flowing stream of the ocean.

In the geography of the Homeric age there was not supposed to be any communication between the Mediterranean and this all-encircling ocean river. When, in consequence of the excursions of the Phœnicians, the communication through the Pillars of Hercules became known, ideas respecting the outer sea gradually changed. At first, curiously enough, the Atlantic Ocean was regarded as muddy, shallow, and little agitated by the winds—a belief apparently associated with the supposed subsidence of the legendary island of Atlantis. The world, as known to the ancients down to about 300 years before Christ, is represented in this map of Hecatæus.

There seems to be no doubt that the spherical form of the earth was known to some philosophers even before the time of Aristotle—the proof that the earth is a sphere being indeed easy to minds that had received a mathematical training—but these have been few in all ages, and an idea so directly opposed to the apparent evidence of the senses could only be expected to win its way with difficulty. Indeed, at the present day the majority of even educated people are unable to give any reason for their belief that the earth is a sphere, other than that navigators are now in the habit of sailing around it.

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[1] Lecture delivered at the Aberdeen meeting of the British Association by Mr. John Murray, Director of the *Challenger* Reports.